



COPY OF PAPERS  
ORIGINALLY FILED

PATENT  
Docket No. 1082-370

#22  
09/19/02  
BS

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of: )  
SANDERSON et al. ) Group Art Unit: 1711  
Entitled: "SYNTHESIS OF ENERGETIC ) Examiner: Sergent, R.  
THERMOPLASTIC ELASTOMERS )  
CONTAINING BOTH POLYOXIRANE )  
AND POLYOXETANE BLOCKS" )  
Serial No. 09/436,360 )  
Filed: November 9, 1999 )

Assistant Commissioner  
for Patents  
U.S. Patent and Trademark Office  
Washington, D.C. 20231

September 3, 2002

**BRIEF ON APPEAL**

Dear Sir:

In response to the final Office Action dated February 4, 2002 and the Advisory Action dated May 29, 2002, Applicants submit herewith this Brief on Appeal in triplicate as required by 37 C.F.R. § 1.192. A Notice of Appeal was filed on July 3, 2002, *i.e.*, within the past two months. Applicants respectfully submit that this appeal is proper, because the claims have been twice and finally rejected.

09/11/2002 AWONDAF1 00000037 010481 09436360

01 FC:120 320.00 CH

RECEIVED  
SEP 17 2002  
TC 1700

If any additional fees are due in connection with the filing of this Brief on Appeal, please charge our Deposit Account No. 01-0481 and accept this paper as a petition for extension.

**(1) REAL PARTY IN INTEREST**

The real party in interest is Alliant Techsystems Inc., the assignee of record of the above-identified application.

**(2) RELATED APPEALS AND INTERFERENCES**

There is a related appeal which may directly affect or may be directly affected by or have a bearing on the Board's decision in the pending appeal. The related appeal is in U.S. patent application no. 09/436,440. Although the applications neither share a common claim of priority nor claim a benefit of priority of the other, the applications do involve similar subject matter and the resolution of related issues on appeal.

**(3) STATUS OF THE CLAIMS**

Claims 1-13 and 43-47 remain pending.

Claims 1-13 and 43-47 stand rejected.

**(4) STATUS OF AMENDMENTS FILED SUBSEQUENT TO FINAL REJECTION**

An Amendment under 37 C.F.R. § 1.116 was filed on May 3, 2002. In an Advisory Action dated May 29, 2002, the Examiner stated that the Amendment would be entered upon the timely submission of a Notice of Appeal and Appeal Brief with the requisite fees.

Applicants have filed herewith a Response accompanied with a terminal disclaimer. Because the Response and terminal disclaimer reduce the number of issues on appeal, Applicants respectfully submit that the Response and terminal disclaimer should be entered. Applicants have prepared this Appeal Brief based on the assumption that the Response and terminal disclaimer will be entered.

**(5) CONCISE EXPLANATION OF THE INVENTION**

The invention relates to energetic thermoplastic elastomers that are useful as binders for energetic compositions, such as rocket propellants, gun propellants, munitions, and gas generants. (Page 1, lines 9-12.)

In accordance with a first aspect of the invention, the thermoplastic elastomer comprises A blocks and B blocks connected to one another via a linker (also referred to as a “linking group”). The A blocks are the “hard” or crystalline polyether blocks derived from monomers comprising one or more oxetane derivatives. The A blocks are crystalline at temperatures below about 60°C. The B blocks are the “soft” blocks derived from monomers comprising at least one member selected from the group consisting of oxirane and derivatives thereof. The B blocks are amorphous at temperatures above -20°C. Both the A blocks and the B blocks are terminated with isocyanate-reactive groups, such as diols. (Page 4, line 21 to page 5, line 1.) The linkers are provided to effect linking, and are derived from at least one diisocyanate

and at least one linking compound comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate. The diisocyanate may be used to cap the A blocks and B blocks. The isocyanate-capped blocks are then linked together with the linking compound. (Page 5, lines 1-4.)

In accordance with another preferred embodiment of the first aspect of the invention, the A blocks are crystalline below about 75°C. (Page 6, lines 9-11.) The A blocks may comprise homopolymers, copolymers, or terpolymers derived from one or more symmetrically-substituted oxetane monomers comprising 3,3-bis(methylnitraminomethyl)oxetane and/or 3,3-bis(azidomethyl)oxetane. (Page 8, lines 20-22.)

In accordance with still another preferred embodiment, the B blocks comprise a member selected from the group consisting of difunctional glycidyl azide polymer and poly(glycidyl nitrate). (Page 8, lines 7-11.)

The thermoplastic elastomer may have a weight average molecular weight of at least 40,000 and a number average molecular weight of at least 10,000, more preferably a weight average molecular weight of at least 60,000 and a number average molecular weight of at least 12,000, and still more preferably a weight average molecular weight of at least 80,000 and a number average molecular weight of at least 15,000. The weight ratio of A to B blocks may be between about 15:85 to about 40:60. (Page 8, line 25 to page 9, line 10.)

In accordance with another aspect of the invention, an energetic thermoplastic elastomer comprises A blocks and B blocks connected to one another via a linker (also referred to as a “linking group”). The thermoplastic elastomer is present in a solid state suitable for use as a binder for at least one of a propellant, explosive, and gasifier. The A blocks are “hard” or crystalline polyether blocks derived from monomers comprising at least one member selected from the group consisting of 3,3-bis(ethoxymethyl)oxetane, 3,3-bis(chloromethyl)oxetane, 3,3-bis(methoxymethyl)oxetane, 3,3-bis(fluoromethyl)oxetane, 3,3-bis(acetoxyethyl)oxetane, 3,3-bis(hydroxymethyl)oxetane, 3,3-bis(methoxyethoxymethyl)oxetane, 3,3-bis(iodomethyl)oxetane, 3,3-bis(nitratomethyl)oxetane, 3,3-bis(methylnitraminomethyl)oxetane, and 3,3-bis(azidomethyl)oxetane. The A blocks are crystalline below about 60°C. The B blocks comprise at least one member selected from the group consisting of glycidyl azide polymer and poly(glycidyl nitrate). The B blocks are amorphous above about -20°C. The linker is derived from at least one diisocyanate and at least one linking compound comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate. (Page 7, lines 10-18.)

In accordance with a preferred embodiment of the first and second aspects of the invention, the diisocyanate of the linker contains a first isocyanate moiety which is at least five times more reactive with the terminal

groups of the blocks than a second isocyanate moiety thereof, whereby the more reactive first isocyanate moiety is capable of reacting with and end capping the terminal groups of the blocks, leaving the less reactive second isocyanate moiety free and unreacted. Further, the linking compound has two isocyanate-reactive groups which are sufficiently sterically unhindered to be reactive with the free and unreacted second isocyanate moieties of the end-capped blocks. It is especially preferred that the diisocyanate comprises 2,4-toluene diisocyanate. (Page 12, line 7 to page 13, line 2.)

**(6) CONCISE EXPLANATION OF THE ISSUES PRESENTED FOR REVIEW**

(1) Whether claims 1-13 and 43-47 are rendered unpatentable under the judicially created doctrine of obviousness-type double patenting over claims 1-11 and 31-41 of copending patent application 09/436,440.

(2) Whether claim 4 is indefinite under 35 U.S.C. § 112 (hereinafter “Section 112”), second paragraph, for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

(3) Whether claims 1-11 and 33-41 are obvious under 35 U.S.C. § 103(a) (hereinafter “Section 103(a)”) over U.S. Patent No. 4,806,613 to Wardle (hereinafter “Wardle”) in view of U.S. Patent No. 4,976,794 to Biddle (hereinafter “Biddle”) and U.S. Patent No. 5,747,603 to Hinshaw (hereinafter “Hinshaw”).

**(7) GROUPING OF THE CLAIMS**

Claims 1-3, 5-13, and 43-47 stand or fall together.

Claim 4 stands or falls alone.

**(8) ARGUMENTS**

**(a) *The Provisional Rejection of Claims 1-13 and 43-47 under the Judicially Created Doctrine of Obviousness-Type Double Patenting Has Been Overcome by the Filing of a Terminal Disclaimer***

Applicants have submitted a terminal disclaimer with the Response filed concurrently herewith. As acknowledged in the final Office Action, a terminal disclaimer in compliance with 37 C.F.R. 1.321(c) overcomes a provisional rejection based on a nonstatutory double patenting ground.

Thus, Applicants respectfully submit that this rejection has been rendered moot, and no longer is the subject of this appeal.

**(b) *A Person of Ordinary Skill in the Art Would Not Have Considered Claim 4 Indefinite under 35 U.S.C. § 112, Second Paragraph***

In numbered paragraph 4 of the final Office Action, claim 4 was rejected under Section 112, second paragraph, as indefinite on the following ground:

The subject matter of claim 4, as amended, fails to further limit claim 1. Since claim 1 now requires the A blocks to be crystalline below about 60°C, the subject matter of claim 4 is not limiting at temperatures exceeding 60°C. For example, according to claim 1, the A block can be non-crystalline at 61°C; however, claim 4 cannot allow for this possibility, yet it depends from claim 1.

This rejection is traversed.

It is an axiom of patent law that a claim must be interpreted as it would be by one of ordinary skill in the art. Such skilled artisans understand that blocks of the type described in the application have a transition point below which the blocks are crystalline and above which the blocks are amorphous.

The language “below about 60°C” of claim 1 is broader in scope than the language “below about 75°C” of claim 4. All compounds that are crystalline below about 75°C will also be crystalline below about 60°C. Thus, claim 1 is at least as broad as claim 4. However, the converse is not true. A compound may be crystalline below about 60°C, but amorphous between about 60°C and about 75°C. That is, a compound may satisfy the features of claim 1, but not claim 4.

In terms of the example provided in the final Office Action, the Examiner is correct in stating that claim 1 allows the A block to be non-crystalline at [about] 61°C. The Examiner is further correct in stating that claim 4 “cannot allow for this possibility,” because claim 4 requires the A block to remain crystalline below about 75°C. Because claim 1 allows for a possibility that claim 4 restricts, this example contradicts the Examiner’s assertion that claim 4 does not further limit claim 1.

By way of another example, assume that “block X” is an example of an A block, and block X has a transition point at about 65°C. That is, block X is crystalline at temperatures below about 65°C and amorphous at temperatures above about 65°C. Under this scenario, block X meets the crystallinity requirement of claim 1, because block X is crystalline below about 60°C, as recited in claim 1. However, block X does not meet the crystallinity requirement of claim 4, because block X is amorphous at about 75°C. Thus, claim 1 reads on block X, but claim 4 does not read on block X. Stated differently, claim 1 is broader than claim 4. Claim 4 limits claim 1.

For these reasons, it is respectfully submitted that all claims are in full compliance with 35 U.S.C. § 112, and that the Section 112, second paragraph rejection should be reversed.

**(c) *The Examiner Has Not Established a Prima Facie Case of Obvious Against Claims 1-13 and 43-47 Under 35 U.S.C. § 103(a)***

In numbered paragraph 8 of the final Office Action, claims 1-13 and 43-47 were rejected under Section 103(a) as being obvious over Wardle in view of Biddle and Hinshaw.

Applicants respectfully traverse the Section 103(a) rejection.

It is fundamental law that it is improper under Section 103(a) to use hindsight reconstruction to pick and choose among isolated disclosure in the prior art to deprecate the claimed invention. *In re Fritch*, 23 USPQ2d 1780,

1784 (Fed. Cir. 1992). Teachings of references can be combined only if there is some suggestion or motivation to do so. *Smithkline Diagnostics, Inc. v. Helena Lab. Corp.*, 859 F.2d 878, 886-87 (Fed. Cir. 1988). This burden of obviousness has not been met with regard to claims 1-13 and 41-47 and, therefore, this rejection is traversed.

Wardle discloses a method for producing thermoplastic elastomers having alternating A blocks and B blocks. The A and B blocks are both polyethers derived from oxetane, THF, and their derivatives. Examples of suitable oxetanes are listed at column 4, lines 42-61, and are discussed throughout Wardle. As the Examiner acknowledges, Wardle is silent regarding the use of an oxirane-based soft segment.

Biddle discloses laundry lists of soft blocks and hard blocks in columns 6-7. Polyglycidyl nitrate (“PGN”) and polyglycidyl azide (“GAP”) are mentioned at the bottom of the list of soft blocks. The list of soft blocks also mentions “amorphous polyoxetane,” of which there are several species. It is estimated that there are no fewer than fifteen (15) soft blocks listed in Biddle, of which only PGN and GAP are “B blocks” as recited in the present claims. Of the twenty four (24) hard blocks listed in columns 6-7 of Biddle, BEMO is the only oxetane.

Thus, the likelihood of a person of ordinary skill in the art picking a combination of the claimed A blocks and B blocks from those listed in the Biddle '794 patent is approximately 2 in 360, or less than one percent.

In cases where the generality of the reference encompasses many possibilities, the courts have long required that the prior art furnish motivation for singling out particularities within the generalities as a prerequisite to obviousness. This was the holding in *In re Luvisi*, 144 USPQ 646 (CCPA 1965), where the Court cited the following excerpt from the opinion of the Patent Office Board of Appeals in *Ex parte Garvey*, 41 USPQ 583, 584 as being on point:

While the invention here claimed in its broader aspect is doubtless embraced within the speculative teachings of the references, we doubt if references which are not directed to the same purpose and do not have the same inventive concept can be fairly applied in rejecting claims such as those on appeal *where anticipation can be found only by making one of a very great number of possible permutations which are covered by the reference disclosures*. The likelihood of producing a composition such as here claimed from a disclosure such as shown by the Dykstra patent would be about the same as the likelihood of discovering the combination of a safe from a mere inspection of the dials thereof.

(Emphasis in original).

In addition to the low statistical probability of picking the claimed A and B blocks from Biddle's lists, there are other reasons that would have militated against a person of ordinary skill in the art using the teachings of

Wardle to pick PGN or GAP from the soft block list and BEMO from the hard block list of Biddle.

Wardle discusses the influence that the reactivity of the oxetanes' primary hydroxyl groups has on the reaction at column 8, lines 48-53, which are reproduced in part below:

The reactivity of the terminal hydroxyl groups varies according to steric factors and also according to side-chain moieties. Energetic oxetanes, for example, generally have side-chain moieties that are electron-withdrawing, making their terminal hydroxyl groups less reactive.

A polyoxirane ether possesses a secondary hydroxyl group. Persons having ordinary skill in the art would have understood that the electron-withdrawing effect of side-chain moieties of secondary hydroxyl groups is much greater than that of a primary hydroxyl group. In particular, the nitrate ester moiety of glycidyl nitrate has a significant electronic effect on the hydroxyl group, and adversely influences the reactivity of the hydroxyl group. Given the relatively low reactivity of the secondary hydroxyl groups of GAP and PGN, a person of ordinary skill in the art would have been more likely to pick one of the other soft blocks mentioned in Biddle.

Applicants further respectfully submit that Hinshaw would have taught away from selecting PGN or GAP from the soft block list of Biddle for use in the Wardle process. Specifically, Hinshaw describes difficulties involved with chain-linking a secondary hydroxyl group of an oxirane:

Also, because the terminal hydroxyl groups of GAP are secondary hydroxyl groups, curing with polyfunctional isocyanates is less efficient than is desirable for achieving good mechanical characteristics of the cured elastomer.

Column 1, lines 57-61.

To achieve good curing, Hinshaw discloses end-capping the non-primary hydroxyl group. The end-capping compound has a hydroxyl-reactive group at one end and a group at the other end which is removable to provide a primary, unhindered hydroxyl group. The hydroxy-terminated polymers are then chain-extended with a diisocyanate.

The end-capping technique of Hinshaw differs from the end-capping technique of the claimed invention, not to mention the end-capping technique of Wardle. Given the teachings of Hinshaw, it is unlikely that a person of ordinary skill in the art would have (i) selected PGN or GAP from the soft block list in Biddle and (ii) end-capped and linked PGN or GAP in the manner taught by Wardle.

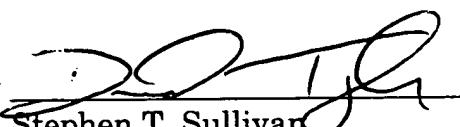
For these reasons, reversal of the Section 103(a) rejection is respectfully requested.

**(9) CONCLUSION**

For all the above-discussed reasons, it is clear that the inventions recited in Applicants' claims are patentable over the art of record. Accordingly, reversal of the remaining rejection and allowance of claims 1-13 and 43-47 are respectfully requested.

Respectfully submitted,  
Sullivan Law Group

By

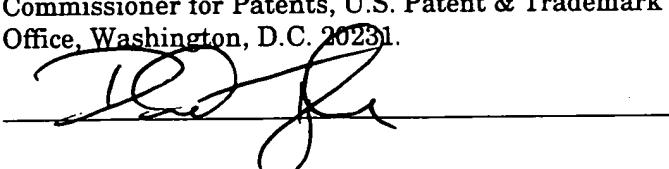
  
Stephen T. Sullivan  
Registration No. 32,444  
Telephone No. (602) 956-6161  
Fax No.: (602) 956-6262

-- and --

David S. Taylor  
Registration No. 39,045  
Telephone No. (202) 661-6114

Sullivan Law Group  
5060 North 40<sup>th</sup> Street  
Suite 120  
Phoenix, Arizona 85018

I hereby certify that this Brief on Appeal is being deposited with the United States Postal Service on September 3, 2002 with sufficient postage as first class mail in an envelope addressed the Assistant Commissioner for Patents, U.S. Patent & Trademark Office, Washington, D.C. 20231.



**(10) APPENDIX: CLAIMS ON APPEAL**

1. An energetic thermoplastic elastomer having A blocks and B blocks and being present in a solid state suitable for use as a binder for at least one of a propellant, explosive, and gasifier, the energetic thermoplastic elastomer being formed from a composition comprising, as constituents:

A blocks terminated with isocyanate-reactive groups derived from monomers comprising one or more oxetane derivatives, the A blocks being crystalline below about 60°C;

B blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of oxirane and derivatives thereof, the B blocks being amorphous above about -20°C; and

linking groups derived from at least one diisocyanate and at least one linking compound comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate.

2. An energetic thermoplastic elastomer as defined in claim 1, wherein:

the diisocyanate contains a first isocyanate moiety which is at least five times more reactive with the terminal groups of the blocks than a second isocyanate moiety thereof, whereby the more reactive first isocyanate moiety

is capable of reacting with and end capping the terminal groups of the blocks, leaving the less reactive second isocyanate moiety free and unreacted; and the linking compound has two isocyanate-reactive groups which are sufficiently sterically unhindered to be reactive with the free and unreacted second isocyanate moieties of the end-capped blocks.

3. An energetic thermoplastic elastomer as defined in claim 2, wherein the diisocyanate comprises 2,4-toluene diisocyanate.

4. An energetic thermoplastic elastomer as defined in claim 1, wherein the A blocks are crystalline below about 75°C.

5. An energetic thermoplastic elastomer as defined in claim 1, wherein the A blocks comprise homopolymers, copolymers, or terpolymers derived from one or more symmetrically-substituted oxetane monomers comprising at least one member selected from the group consisting of 3,3-bis(methylnitraminomethyl)oxetane and 3,3-bis(azidomethyl)oxetane.

6. An energetic thermoplastic elastomer as defined in claim 1, wherein the B blocks comprise difunctional glycidyl azide polymer.

7. An energetic thermoplastic elastomer as defined in claim 1, wherein the B blocks comprise poly(glycidyl nitrate).
8. An energetic thermoplastic elastomer as defined in claim 1, wherein the thermoplastic elastomer has a weight average molecular weight of at least 40,000 and a number average molecular weight of at least 10,000.
9. An energetic thermoplastic elastomer as defined in claim 1, wherein the thermoplastic elastomer has a weight average molecular weight of at least 60,000 and a number average molecular weight of at least 12,000.
10. An energetic thermoplastic elastomer as defined in claim 1, wherein the thermoplastic elastomer has a weight average molecular weight of at least 80,000 and a number average molecular weight of at least 15,000.
11. An energetic thermoplastic elastomer as defined in claim 1, wherein a weight ratio of A to B blocks is between about 15:85 to about 40:60.
12. An energetic thermoplastic elastomer as defined in claim 1, wherein the isocyanate-reactive terminal groups of the A and B blocks are hydroxyl groups.

13. An energetic thermoplastic elastomer as defined in claim 1, wherein the isocyanate-reactive terminal groups of the B blocks are secondary hydroxyl groups.

43. An energetic thermoplastic elastomer having A blocks and B blocks and being present in a solid state suitable for use as a binder for at least one of a propellant, explosive, and gasifier, the energetic thermoplastic elastomer being formulated from a composition comprising, as constituents:

A blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of 3,3-bis(ethoxymethyl)oxetane, 3,3-bis(chloromethyl)oxetane, 3,3-bis(methoxymethyl)oxetane, 3,3-bis(fluoromethyl)oxetane, 3,3-bis(acetoxymethyl)oxetane, 3,3-bis(hydroxymethyl)oxetane, 3,3-bis(methoxyethoxymethyl)oxetane, 3,3-bis(iodomethyl)oxetane, 3,3-bis(nitratomethyl)oxetane, 3,3-bis(methylnitraminomethyl)oxetane, and 3,3-bis(azidomethyl)oxetane, the A blocks being crystalline below about 60°C;

B blocks terminated with isocyanate-reactive groups and comprising at least one member selected from the group consisting of glycidyl azide polymer and poly(glycidyl nitrate), the B blocks being amorphous above about -20°C; and

linking groups derived from at least one diisocyanate and at least one linking compound comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate.

44. An energetic thermoplastic elastomer as defined in claim 43,  
wherein:

the diisocyanate contains a first isocyanate moiety which is at least five times more reactive with the terminal groups of the blocks than a second isocyanate moiety thereof, whereby the more reactive first isocyanate moiety is capable of reacting with and end-capping the terminal groups of the blocks, leaving the less reactive second isocyanate moiety free and unreacted; and

the linking compound has two isocyanate-reactive groups which are sufficiently sterically unhindered to be reactive with the free and unreacted second isocyanate moieties of the end-capped blocks.

45. An energetic thermoplastic elastomer as defined in claim 44,  
wherein the diisocyanate comprises 2,4-toluene diisocyanate.

46. An energetic thermoplastic elastomer as defined in claim 43,  
wherein the B blocks comprise difunctional glycidyl azide polymer.

47. An energetic thermoplastic elastomer as defined in claim 43,  
wherein the B blocks comprise poly(glycidyl nitrate).